Clinical Care Management and Workflow by Episodes

Paul L. Claus, MD, Paul C. Carpenter, MD, Christopher G. Chute, MD DrPH,
David N. Mohr, MD, Patricia S. Gibbons
Mayo Clinic, Rochester, Minnesota

This paper describes the implementation of clinically defined episodes of care and the introduction of an episode-based summary list of patient problems across Mayo Clinic Rochester in 1996 and 1997. Although Mayo's traditional paper-based system has always relied on a type of 'episode of care' (called the "registration") for patient and history management, a new, more clinically relevant definition of episode of care was put into practice in November 1996. This was done to improve care management and operational processes and to provide a basic construct for the electronic medical record. Also since November 1996, a computer-generated summary list of patient problems, the "Master Sheet Summary Report," organized by episode, has been placed in all patient histories. In the third quarter of 1997, the ability to view the episode-based problem summary on-line was made available to the 3000+ EMR-capable workstations deployed across the Mayo Rochester campus. In addition, the clinically oriented problem summarization process produces an improved basic "package" of clinical information expected to lead to improved analytic decision support, outcomes analysis and epidemiological research.

INTRODUCTION

"A horse, a horse, my kingdom for a horse."
-- Richard III, W. Shakespeare

A recent article by Daniel Beckham in *Healthcare Forum Journal* argues that it was not the horse, but the stirrup that changed the world in the middle ages. He writes, citing William Davidow, "Until the invention of the stirrup, riders on horseback found the experience very unstable. And this was particularly true in battle. [The stirrup] provided the lateral support and leverage necessary to allow a mounted warrior to capture the power of the horse as he brought his sword to bear against a foe."[1] Early in this century, Mayo originated the care delivery model known as the "integrated group practice" which included the notion of a single provider coordinating care during the patient's stay in Rochester, using a kind of 'episode of care' which later came to be known as a "registration." Although Mayo has long used this form of 'episode' to cluster encounters together and provide for overall coordination and a problem summarization process, registrations were typically ended based on the number of days since the patient was last seen, rather than on a strictly clinical determination. Drawing on the metaphor of the saddle and stirrups, this legacy has provided the "saddle" of care delivery at Mayo, with a single equestrian (provider) guiding their charge through battles, real or perceived, until pastured and awaiting another ride and rider – yet lacked until recently the metaphorical "stirrups" in that it did not allow the primary provider to be the sole determinant of the conclusion of care. As Mayo began the process of reviewing its care delivery processes for the electronic medical record (EMR), it become clear that what was needed was a clinically determined process for both managing *and* definitively concluding care, to allow clinical information to be channeled into more efficient work flows for the direct delivery of care to patients and for its clustering into meaningful constructs for later review and analysis. To achieve these additional benefits, a new version of "episode of care" was made an early EMR deliverable. This new definition entails two legacy elements along with a new definition of closure. It is characterized by a) *non-overlapping* periods of care ("episodes") b) coordinated by *a single "primary provider,"* c) brought to an end by the *review of care and the patient's problem list* and the *explicit declaration of "dismissal"* by the primary provider, which goes into effect immediately. This paper briefly reviews the literature on episodes of care and describes the episode of care model now being used at Mayo Rochester and the benefits of organizing care delivery in this way.

BACKGROUND

Brief Review of Literature

Although the usefulness of episodes of care as an important means of 'packaging' health care has long been recognized,[2 3 4 5 6] health care organizations attempting to apply episodes of care have struggled with both conceptual and operational obstacles. Conceptual issues have included the definition of provider responsibility, determination of the end point of care, the capture of problems (which may change in actuality or perception in the course of an episode), and the aggregation of elemental data into workable "chunks" using the often limited data available.[7 8 9 10 11]

Only a few health care organizations have attempted to use episodes for actual care delivery.[12 13 14] This has led to a classic chicken-or-egg scenario: the failure of

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health care to produce a workable "episode" has led to unwillingness by payers to use episodes as a basis of payment and of information systems vendors to include episode constructs as part of their information systems. Methods devised for "putting Humpty together again" from encounter-level or event-level 'pieces' after the actual delivery of care have not yet been able to overcome the basic problem that "the question of which clinician was primarily responsible... will never be definitely answered until the clinicians involved accurately identify who is in charge." [15]

It is helpful to distinguish "episode of care" from other types of "episodes" equally applicable to the health care setting, of which "episode of care" is only one. Hornbrook, Hurtado, and Johnson,[16] in the most thorough discussion of episodes to date, provide a useful distinction between the episode as viewed by the patient ("episode of illness") and the episode of care, as viewed from the perspective of the provider or health care system. In addition, they describe two additional types of episode, "episode of disease" which consists of the actual (scientifically determined or inferred) course of disease and which is considered to be of use in constructing episodes for epidemiological analysis, and "health care maintenance episodes," which are distinguished from episodes of care by virtue of the fact that they do not involve disease processes. An early definition provided by Solon *et al* in 1967, also remains useful: "a series of temporally contiguous health care services related to treatment of a given spell of illness provided in response to a specific request by the patient or other relevant entity." Mayo's approach to episodes of care (versus the other types) agrees with Hornbrook's in its focus on the provider perspective. Episodes, according to Hornbrook, can be defined as having starting points, stopping points, clinical courses, and an associated use of resources, in addition to patients and providers. The diagnostic content of the episode of care has been open to the greatest amount of dispute in the literature. Several observers note that, for an episode of care to take place, it is not necessary for *any* specific medical problem to exist (e.g. this is Hornbrook's view). There is also disagreement over whether an episode should describe a *single* disease or problem or *all* problems affecting the patient during the period of time in which care is being provided. Here two schools of thought have emerged. There are those, including Hornbrook and Salmon, who insist that an episode relates to a specific condition and that other coexisting conditions are to be seen as concurrent episodes which may be treated simultaneously; and those who require that the full set of the patient's problems must be seen within a single episode construct. Wingert *et al* have elaborated on the latter approach to develop a profile of six episode types based on patterns of dominance among the various diagnostic elements.[17] Mayo's approach to episodes has been driven largely by the need to be useful in actual practice and therefore is defined to include all problems of the patient occurring within the period of time involved, rejecting the notion of concurrent or overlapping "episodes," one for each problem.

Episodes of Care at Mayo

The definition of episode of care adopted in 1996 drew heavily upon the traditional notion of a "registration" also described in several previous articles.[18] [19] The main idea of a registration was to assign each patient to an initial service and provider, typically in an Internal Medicine service, which would be responsible for the coordination, review and summarization of care. However, the ending point of the registration was left open, typically set to end 30 days from the date of last service, but it could be extended indefinitely. Exceptions came to be added for local patients and patients on various forms on prolonged or continuing care, and even for situations in which there was simply not space for storage of the histories of patients being actively seen by the service. Over time there came to be fewer incentives for timely dismissal of care which led to chart flow problems and delays in accounts receivable. It was clear that "registrations" would not support the new real-time world planned for the EMR.

METHODS

To address this issue, the Master Sheet Initial Step Project was launched, using a physician-led team composed of process experts from the outpatient and inpatient desks, secretarial staff and Medical Records, Completion and Medical Indexing functions, supported by Information Services and Systems and Procedures staff (Mayo's management engineering group). The new definition and processes were tested and refined in by an iterative series of usability tests in Mayo's Usability Laboratory, described in an earlier paper.[20]

RESULTS

New "Episode of Care" Definition

Mayo's new episode of care construct was engineered to provide a clear, simple and unambiguous designation of a "primary provider" (not to be confused with a "primary care provider") who is responsible for all care provided to the patient and for establishing when the episode of care is over. This definition continues to be based on the integrated group practice model of a single provider coordinating care for a patient, including any care by other

"consulting" providers for as many of the patient's problems as are deemed relevant to the current episode. However, there are new rules for episode closure and completion. In brief, Mayo episodes of care are now defined as follows:

- non-overlapping periods of clinical care
- begins with first service or test given to the patient
- coordinated by a single "primary provider"
- completed by dismissal of care by the primary provider (including review of care and problem list and the explicit declaration of "dismissal")
- allows for multiple problems with focus on those problems currently being addressed
- supports an integrated group practice model:
  * multiple provider record management
  * multiple provider problem list management
  * multiple author document management

Roles of Home Desk and Primary Provider

The episode is opened when the patient checks in at the "home desk" (service of the primary provider) for care. Either ahead of time or when the patient presents the episode is assigned to a specific primary provider. The primary provider will note the patient's problems and initiate orders including orders for consultations. Consulting providers may note additional problems and place additional orders. Once all care has been rendered, the primary provider ends the episode by "dismissing" the care. This means that the primary provider has seen to it that all ordered tests and consultations have occurred that were ordered, that all care planned for the episode has been provided and the care is complete. Once the primary provider has dismissed the care, the episode is over, even though some subsequent documentation or completion tasks may need to be performed. If the patient subsequently presents for care, a new episode is opened, regardless of how soon afterward this may occur or where in the system the patient may present. A key notion is that that the episode does not end until the primary provider has completed their cognitive "work," and therefore the dismissal date may be on *or later than* the date the patient was last seen. Indeed, practically speaking, until this work is done, the care is not yet ready to be handed over to another provider or another health care system. Although the process of assigning primary providers and episode dates is still largely paper-based, it is a real-time process. The primary provider and home desk are identified up front and work is coordinated based on these assignments.

Forms, Reports and Electronic Access

Currently Mayo uses a combination of paper forms and electronic entry to record the episode information and the problem list entries. Currently, episode dates and the primary provider designation are collected on the "Master Sheet Temporary Form" and entered into the Master Sheet/Clinical Notes database after the patient is dismissed, when the history completion and indexing processes take place. For the actual problem entries, both manual and electronic collection methods are in use. For areas using electronic Clinical Notes, the diagnoses are currently entered as part of the note and become part of the Master Sheet database as soon as they are entered. By November 1, 1997, it is estimated that 70% of staff generated outpatient notes, 5% of hospital notes, and all hospital dismissal summaries will be entered into the electronic Clinical Notes system. In addition, surgical diagnoses and procedures are fed automatically into the database from the Surgical Information Reporting System (SIRS). For areas not using electronic Notes, the diagnostic entries are written or typed onto the Master Sheet form, and are later keyed in by Medical Indexing (Medical Information Resources or MIR) personnel after dismissal and completion. MIR also codes all the diagnostic entries using assisted coding methods developed at Mayo.[21] These diagnostic codes (including ICD-9, HICDA and SNOMED codes) are also stored in the Clinical Notes database, although they are not currently used in any clinical reporting. Algorithms are used to eliminate obvious duplicates among the problem entries which are also classified by MIR as either "administrative" or "clinical" based on their diagnostic content.

The layout of the Master Sheet Summary Report is shown in Figure 1. This report is placed in the patient history at the end of the episode by MIR, replacing the manual Master Sheet form. It was first made available for ad hoc reporting in Mayo's Urgent Care Center in July 1996 and was deployed to all EMR workstations in third quarter 1997, becoming part of the standard suite of on-line EMR applications. (In addition, all text written on the Master Sheet form has been keyed in by MIR since January of 1994, albeit not organized into episodes; depending on whether demand emerges for this data, this information could be added to that available via the on-line viewer).

DISCUSSION AND FUTURE DIRECTIONS

Mayo's approach to episodes of care tackles head on the issues which arise from the need to coordinate the work of multiple providers in an integrated group practice setting. These fall into two general areas: a) the coordination of service delivery (assuring that tests, consultations etc. ordered for the patient are done), and b) the coordination of documents and the clinical

content of the patient record. In both instances, in the Mayo model, it is the primary provider who is responsible for this coordination. As part of its EMR development, Mayo is now working with a vendor on applications to support both on-line episode-based work flow management and problem management.

Clinical Workflow Management by Episodes

Future episode management functions will automate the episode information collected by the Master Sheet form, and will be used to monitor the status of services and consultations ordered for the patient during the episode. These in turn will be used to create work lists of episode-related tasks, such as the finalization of the list of problems for the episode and the creation of the Master Sheet Summary Report. Procedural incentives already in place will be automated to encourage timely delivery, review and documentation of the episode. Although the standard episode is now used for most of the Mayo practice, in situations or practices where long-term management of a patient by a single provider is necessary or the norm (e.g. diabetes, leukemia), we have also developed processes to assure that regular review and summarization of care occur, in the belief that this adds value for patients and improves the quality of care.

Problem Management by Episodes

The problem-oriented medical record (POMR) described by Larry Weed in 1969,[22] though widely admired, has proven difficult to implement in practice, and most difficult to implement in complex practices. Salmon *et al* aptly listed numerous shortcomings of the POMR at last year's AMIA Symposium.[23] Among these are the fact that a) several providers may be involved, b) the lists of problems tend to grow to be unwieldy and are difficult to use and maintain, and c) the problems may be vague, interrelated to one another and change over time (either in reality or in the view of the provider), and may be expressed differently by different providers. To address these shortcomings, we are developing what we believe will be a practical approach to automated problem management by putting much of the responsibility for problem management in the hands of the primary provider. Designed as a tool to support the cognitive process of problem management within the context of the episode, a "working list" of problems will allow the emphasis to be placed on the immediate reasons the patient is seeking care and the actions taken to address them. As "owner" of the episode, the primary provider will be able to manage and manipulate the problem entries of other consulting providers. In addition to ownership of the working list, the primary provider will assure that the version of the patient's problems added to the Master Sheet Summary Report at the end of the episode is an accurate, succinct and clinically useful synopsis for future use, and that it accurately represents the problems addressed and the care rendered during the episode.

Figure 1. Master Sheet Summary Report

9-999-999
Test, Patient
12345 Testing Avenue NW

Rochester, MN 55901 US

Master Sheet Summary

Page # 1
Printed: 8-JUL-97 15:46

Drug Sensitivity

Date	Diagnoses	Physician
04-JUN-97 thru 04-JUN-97		Erie, Jay Charles 4-7183 OPH W7
04-JUN-97	After-cat membrane	Erie, Jay Charles 4-7183
27-MAY-97 thru 27-MAY-97		Jaeger, Thomas Mark 4-6438 CIM BA6A
27-MAY-97	Diabetes mellitus; Cataract extraction	Jaeger, Thomas Mark 4-6438 CIM
21-MAY-97 thru 21-MAY-97		Dyck, Peter J. 4-7484 N E8B
21-MAY-97	ROCHESTER DIABETIC NEUROPATHY; Test only	Dyck, Peter J. 4-7484
30-APR-97 thru 13-MAY-97		Erie, Jay Charles 4-7183 OPH W7
30-APR-97	DIAGNOSIS: Posterior capsular fibrosis, left eye	Erie, Jay Charles 4-7183
30-APR-97	OPERATION MAYO EAST 7: >YAG capsulotomy, left eye	Erie, Jay Charles 4-7183
04-MAY-97	Diabetes mellitus	Jaeger, Thomas Mark 4-6438
13-MAY-97	After cataract membrane	Erie, Jay Charles 4-7183
20-MAR-97 thru 08-APR-97		Jaeger, Thomas Mark 4-6438 CIM BA6A
08-APR-97	Diabetes mellitus	Jaeger, Thomas Mark 4-6438 CIM
05-MAR-97 thru 06-MAR-97		Jaeger, Thomas Mark 4-6438 CIM BA6A
06-MAR-97	Diabetes mellitus	Jaeger, Thomas Mark 4-6438
24-DEC-96 thru 25-FEB-97		Erie, Jay Charles 4-7183 OPH W7
27-JAN-97	DIAGNOSIS: Cataract, left eye.	Erie, Jay Charles 4-7183
27-JAN-97	OPERATION METH: >Phacoemulsification, left eye, with placement of 18.5 diopter intraocular lens with review of intraocular power calculation. (Iolab: model#8095B, control#082896 04128, 18.5 intraocular lens)	Erie, Jay Charles 4-7183

CONCLUSION

Mayo's new implementation of episodes of care reflects the nature of its integrated group practice by focusing on the real-time management of patient care processes by a primary provider coordinating the work of others in the service of a given patient in an actual health care setting. This is the "real world" in which care is provided, into which the cognitive services provided by an EMR must be channeled, from which health care services must be launched, and around which health care delivery must be orchestrated. Without this as a starting point, no advice system can advise and no support system can support.

We also believe it may serve as a model for care delivery for other organizations because it can provide an additional dimension of value beyond that which can be provided by systems limited to the elemental encounter or unpunctuated continuum. The "episode of care," not simply as a *post facto* analytic construct, but rather as the principal "package" by which health care services are organized, provided, reviewed and summarized, needs to make its way into the mainstream of health care delivery and health care information systems, not as an afterthought but as part of the foundation, if the long-promised benefits of the EMR are ever to be truly realized.

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